



Climate Change and Sea Level Rise Planning and Adaptation Strategies

Kim Shugar

Department Director
Intergovernmental Programs

Jayantha Obeysekera (Obey)

Department Director
Hydrologic & Environmental Systems
Modeling

**Governing Board Joint Workshop with
the Water Resources Advisory Commission (WRAC)
February 10, 2010**

Climate Change & Sea Level Rise Update

- Recap of Climate Change White Paper
- Adaptation planning
- Intergovernmental coordination

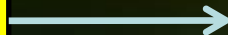


Climate Change & Sea Level Rise

- SFWMD's primary focus is on regional water management issues and coordination with federal/state/local governments
- SFWMD white paper completed

Climate Change Stressors

- **Rising Seas**
- Increasing Temperature
- Changing Precipitation
- Changing Tropical Storms and Hurricanes



Affected Mission Elements

- Flood Control
- Water Supply
- Natural Systems
- Water Quality

White Paper Conclusions

- History is not sufficient to make predictions
- Sea Level Rise is more certain but significant uncertainties exist in projections
- Current Climate Change Projections:
 - 5 to 20 inches of sea levels by 2060, need regional information and coordination with other agencies
 - Increase in temperature up to 7° F and evapotranspiration up to 15%
 - Change in rainfall up to ± 20 percent
 - Changes in the strength and frequency of tropical storms and hurricanes, exact extent is uncertain

Adaptation Planning

✓ Review state of the science

✓ Assess climate vulnerability

Identify critical information gaps

Consider & prioritize key issues of concern

Explore potential adaptation strategies

Identify opportunities &
mechanisms to affect change

Recommend action strategies
(short, medium, long-term)

Building an Adaptation Toolbox

Data

- Historical (temperature, precipitation and sea level)
- Coastal topography (LiDAR and others)
- Sea level rise and storm surge projections
- Temperature and precipitation projections

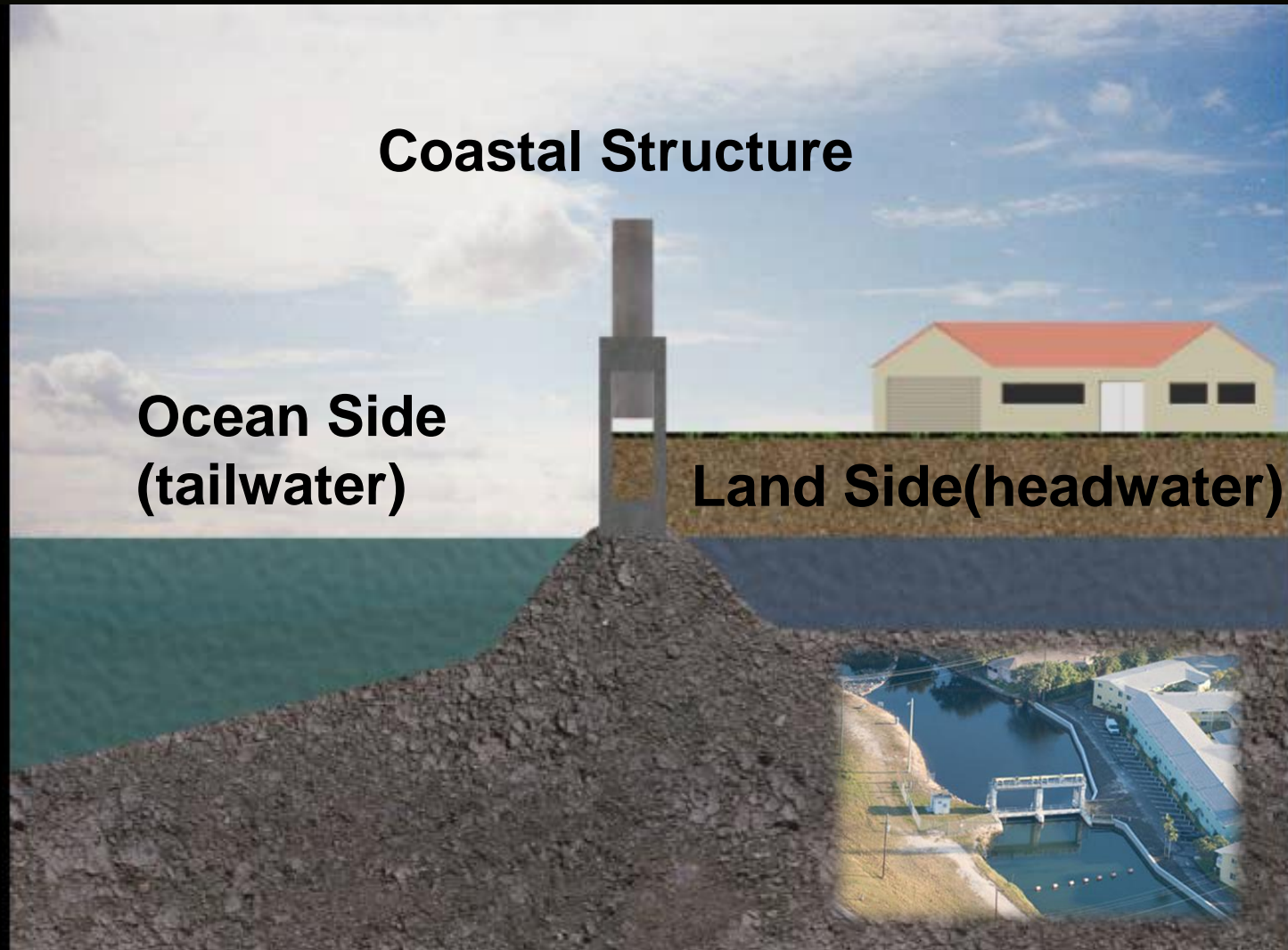
Models

- Digital elevation models
- Storm event simulation models for coastal watersheds
- Saltwater intrusion models for coastal regions

Vulnerability & Adaptation

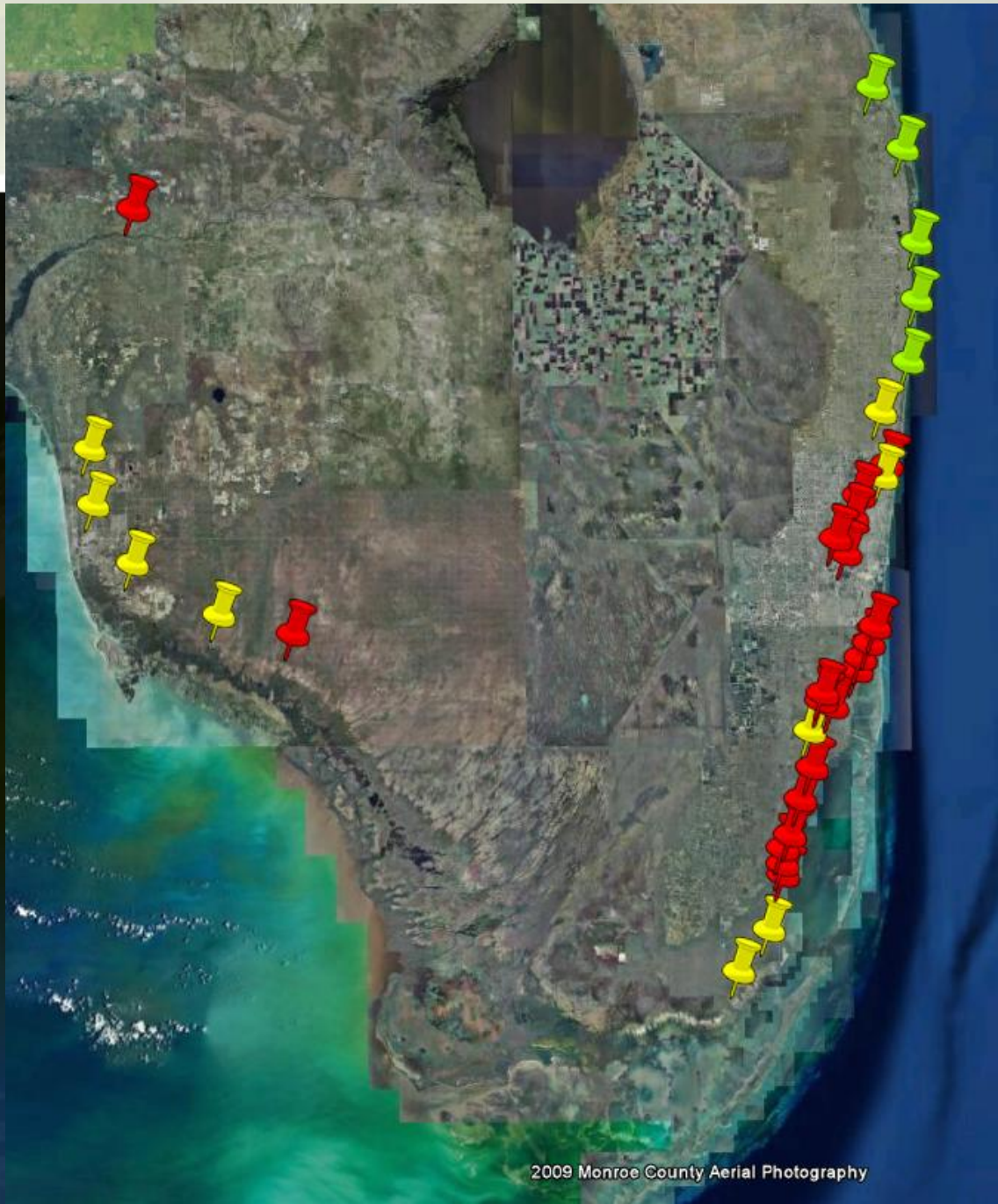
Climate Stressor	Elements Affected	Key Climate Vulnerabilities	Adaptation Strategies
Rising Seas	<ul style="list-style-type: none">• Flood Control• Water Supply• Natural Systems• Water Quality	<ul style="list-style-type: none">• Reduced flood discharge capacity at coastal structures• Saltwater intrusion• Inundation of coastal wetlands, changes in ecology	<ul style="list-style-type: none">• Forward pumping• Determine saltwater/freshwater interface• Update saltwater intrusion monitoring network• Identify utilities at risk• Implement water conservation• Alternatives sources of water Supply• Incorporate sea level rise in planning efforts• Regional coordination

Rising Seas: Flood Control

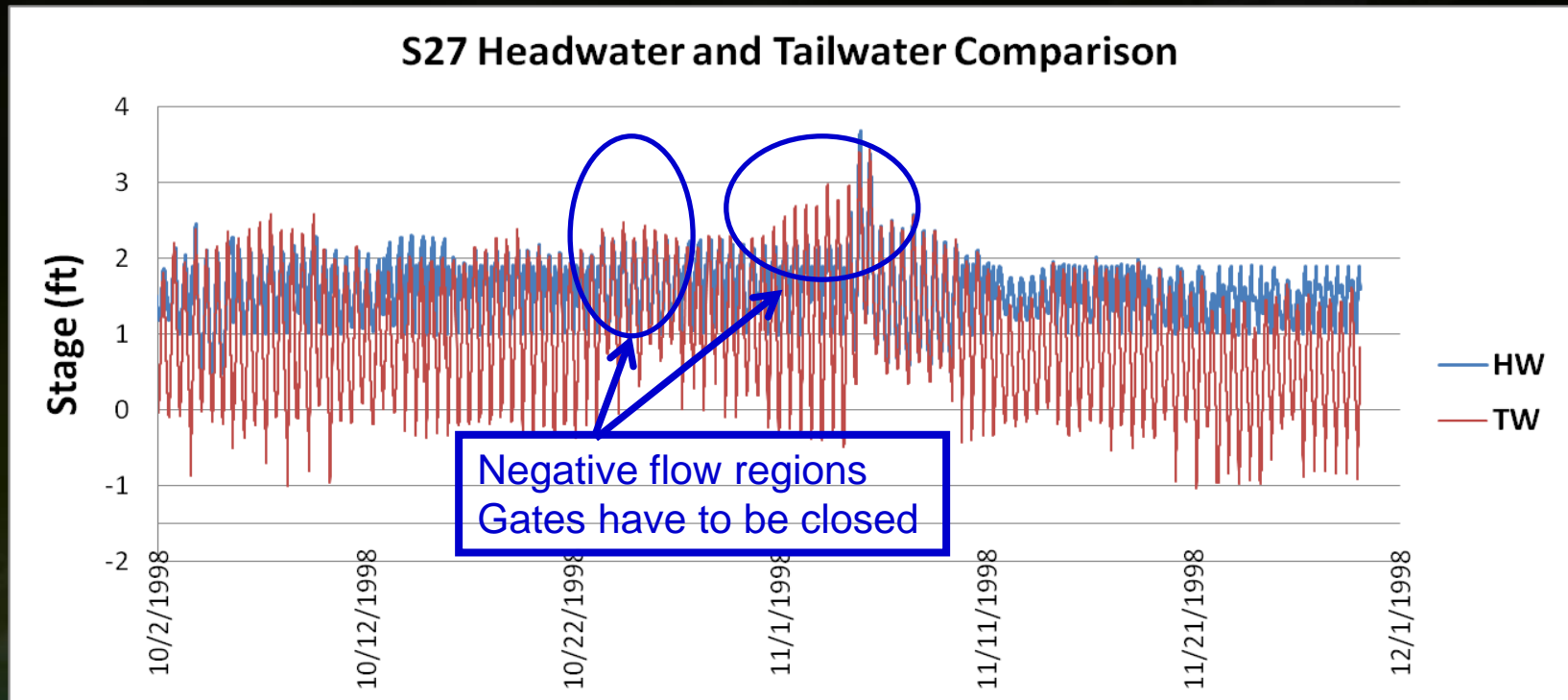


Vulnerable Structures

- Preliminary review based on original designs
- 28 gravity structures on the East Coast
- Six gravity structures on the west coast, including a USACE structure, S-79.
- Most vulnerable structures are in Miami Dade and Broward counties

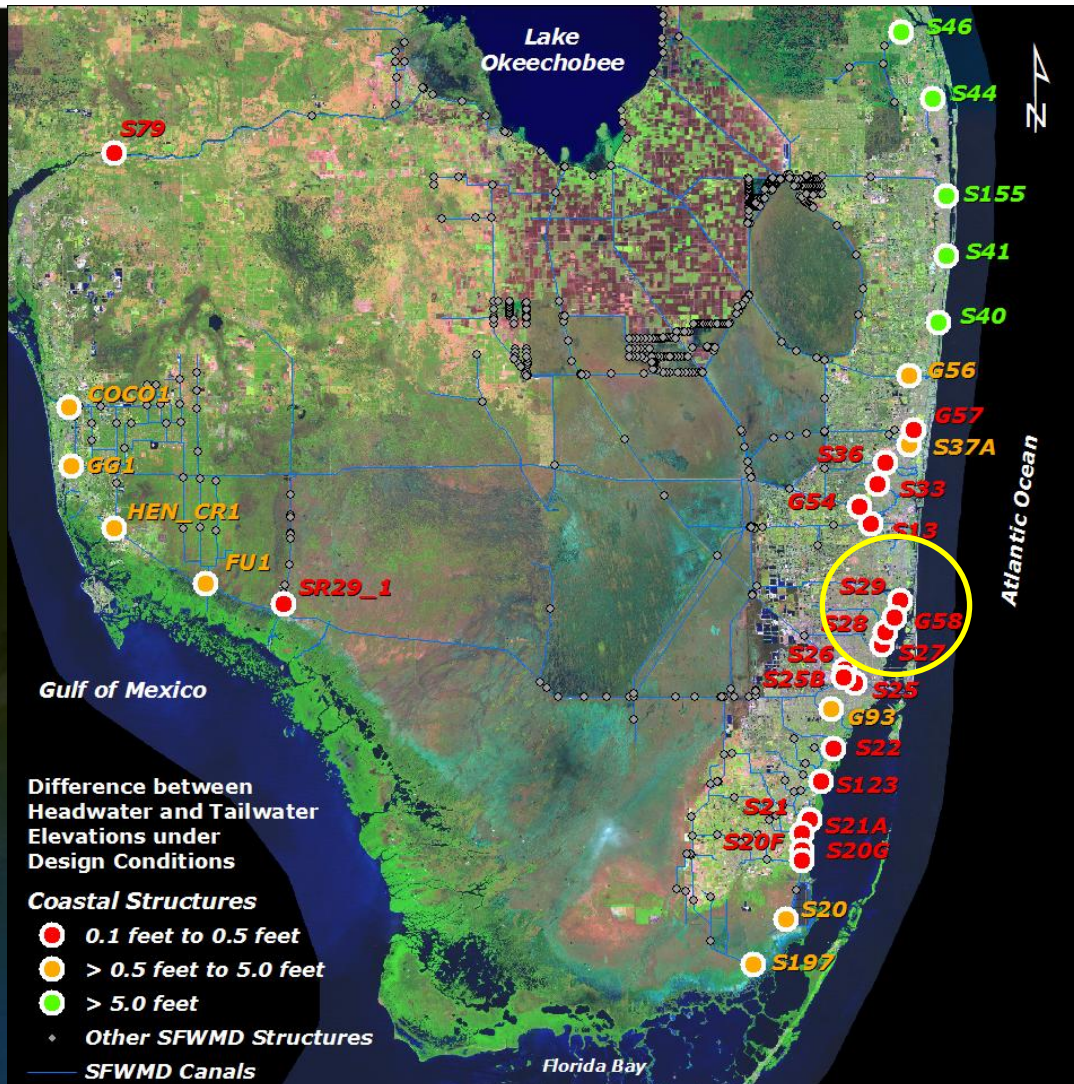


Coastal Spillways Sensitive to Sea Level Rise



Increasing sea level forces gates to close to avoid negative flow. This significantly reduces coastal spillway's flood discharge capacity particularly during the latter part of the hurricane season (Sep. to Nov.).

Preliminary Assessment of Vulnerable Structures

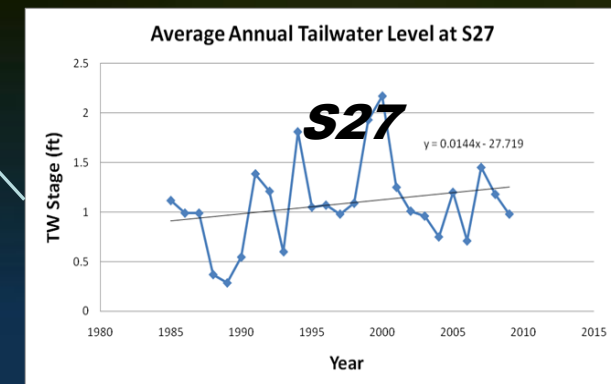
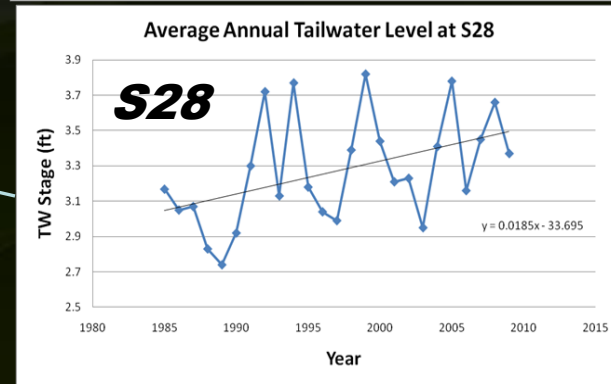
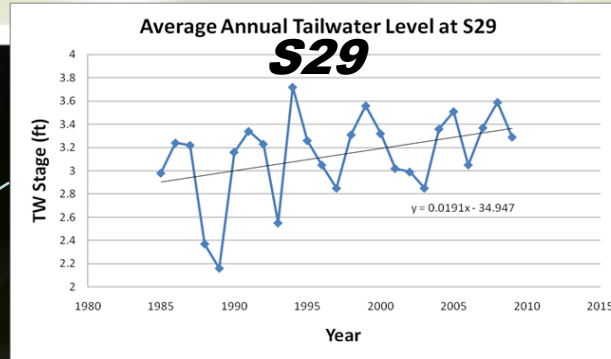
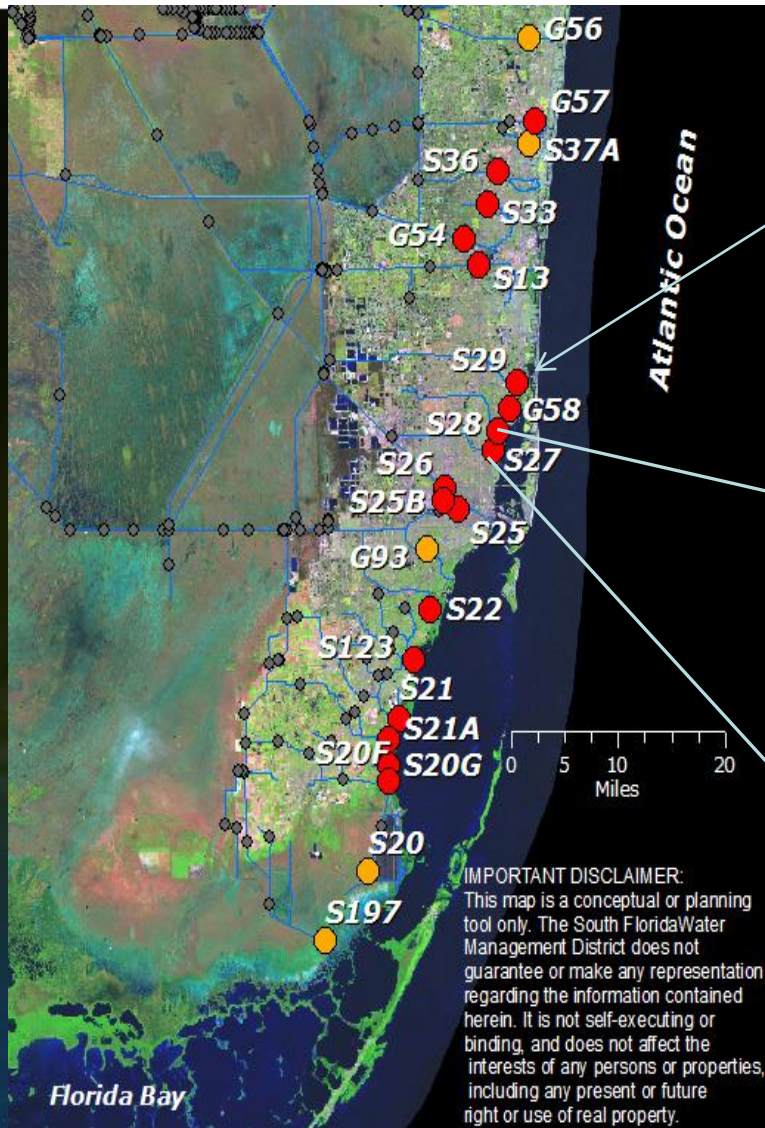


- Prioritize Structures
- S-27, S-28, S-29 north Miami-Dade county

Priority Structures: S-27, S-28, and S-29 Coastal Spillways



Rising Water Levels on Oceanside



Area Surrounding S-27 Structure



C-7 Canal

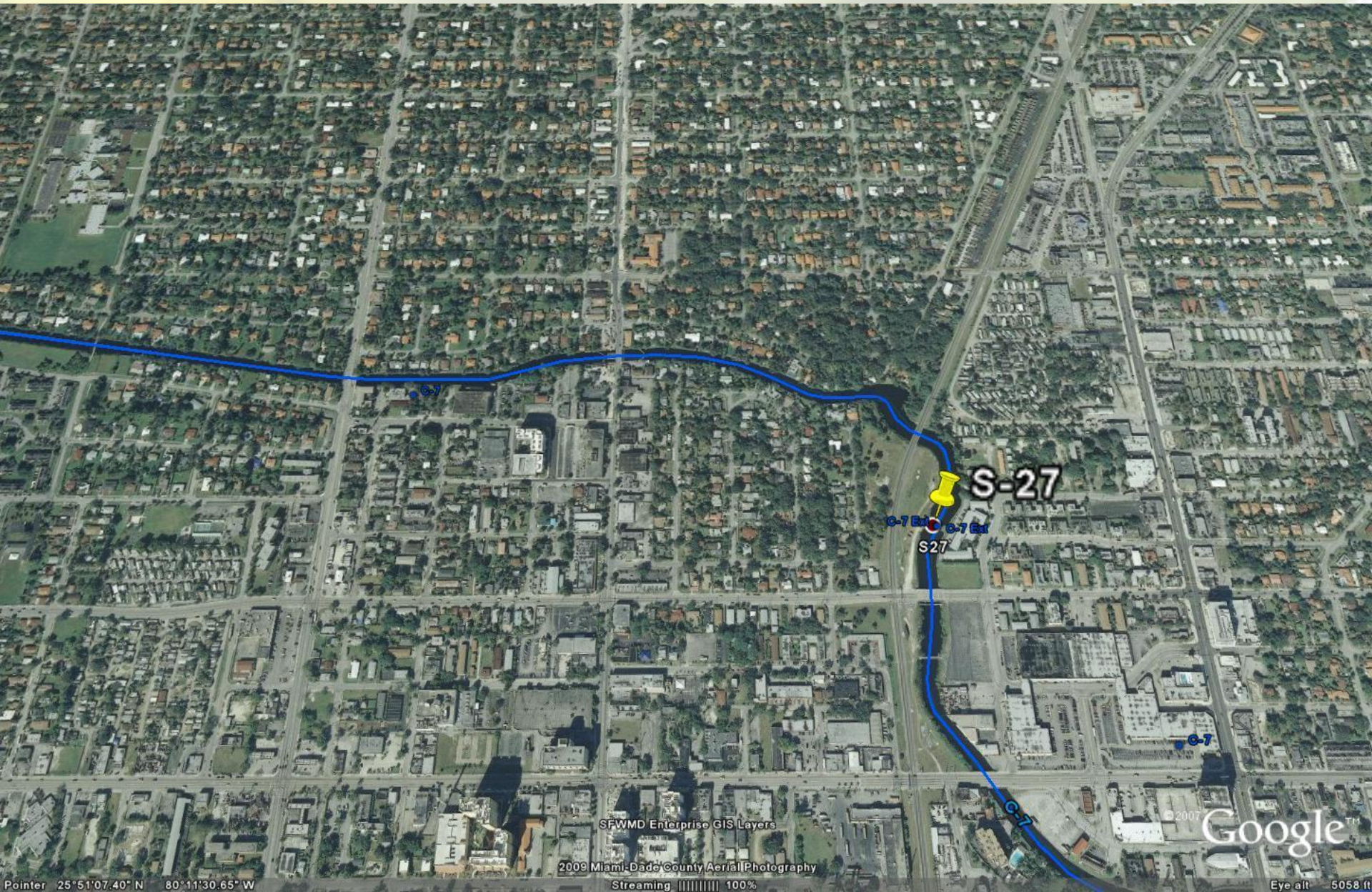
S-27

S27

© 2007

Google

Area Surrounding S-27 Structure (cont.)



SFWMD Enterprise GIS Layers

2009 Miami-Dade County Aerial Photography

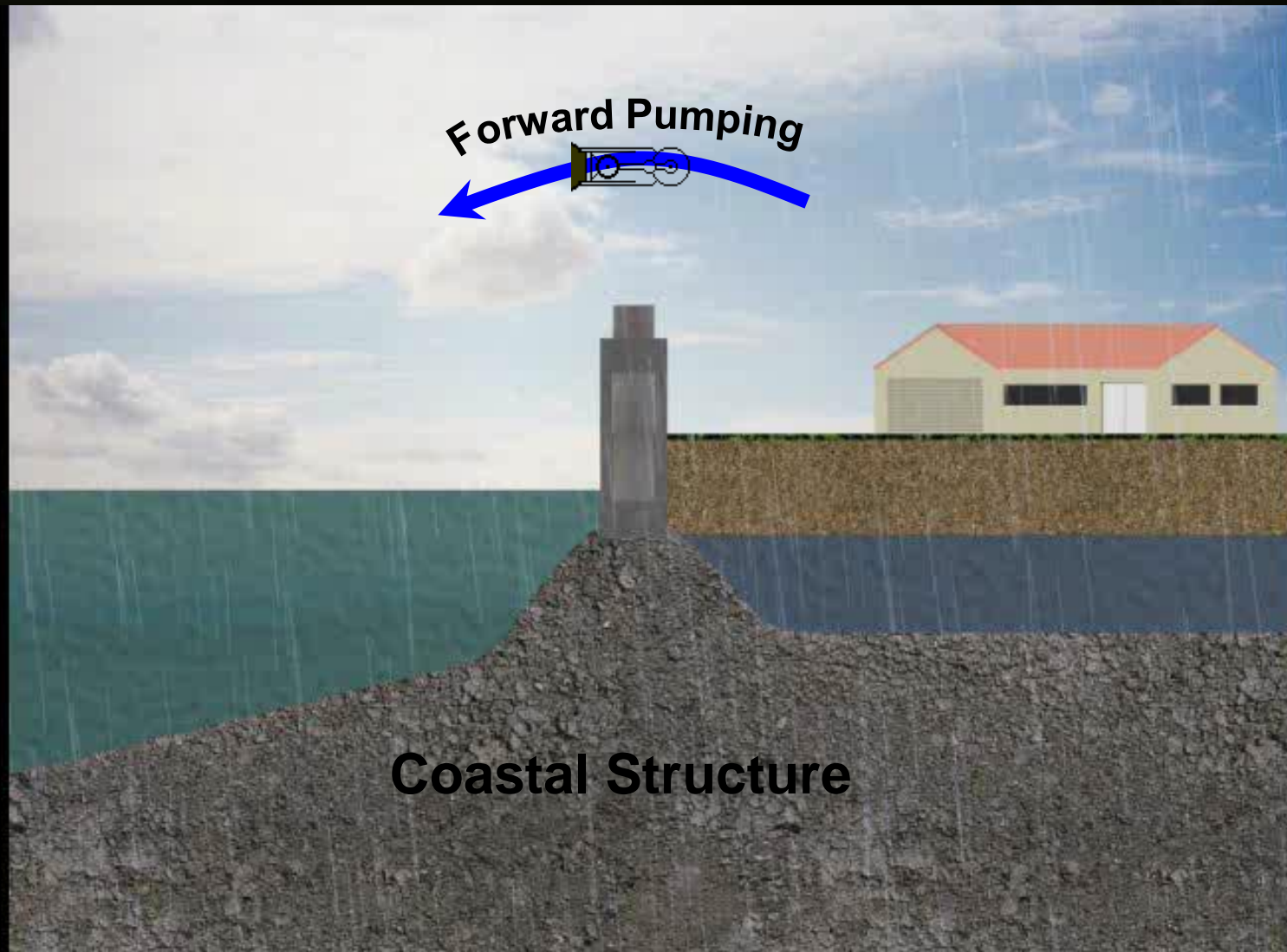
Streaming 100%

Google

Eye alt 5058

Pointer 25°51'07.40" N 80°11'30.65" W

Rising Seas Adaptation - Forward Pumping



Adaptation to Rising Seas

Example: Forward Pumping at S-26 Structure



Preliminary Estimates of Forward Pumping

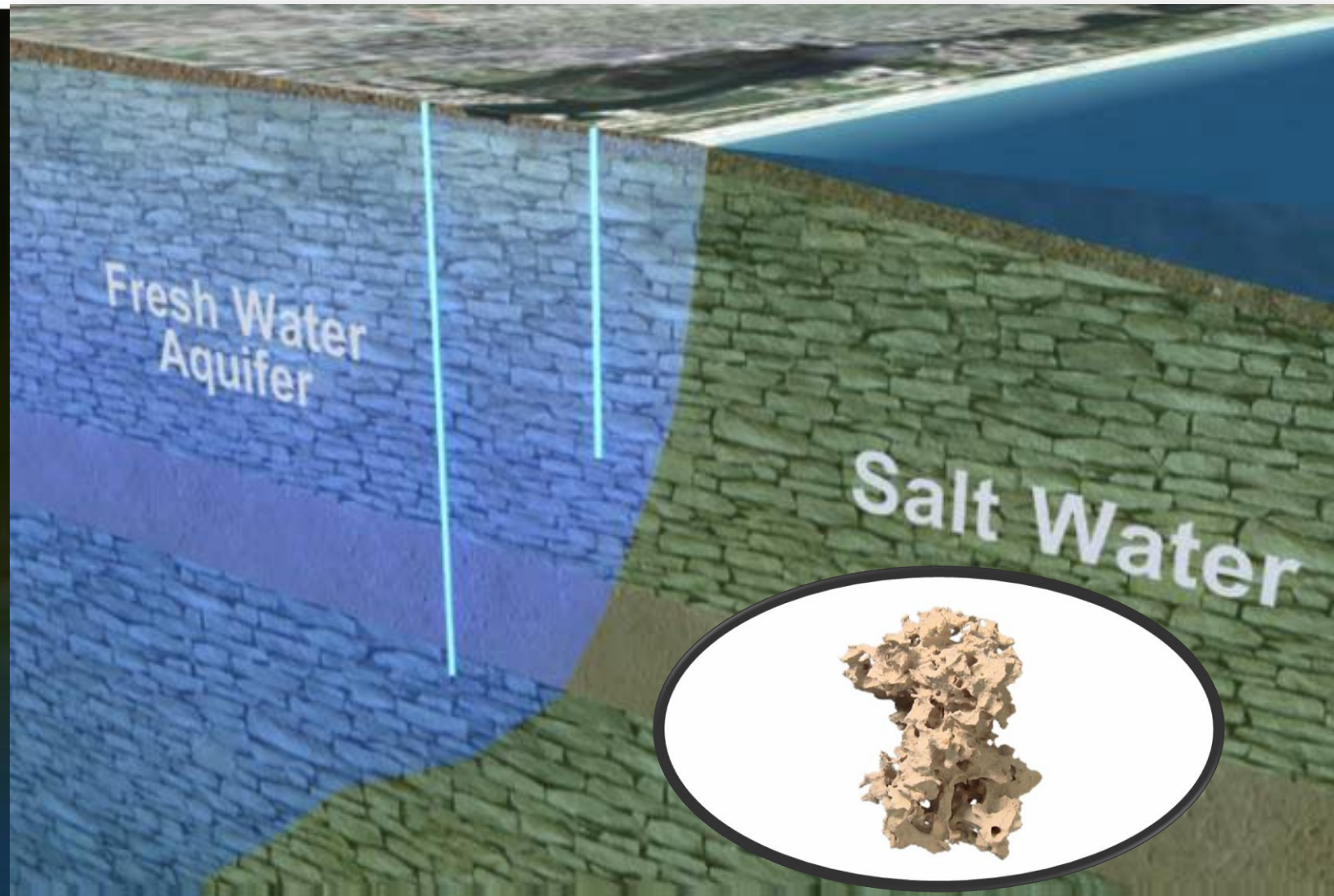
Structure	Original Structure Capacity (cubic feet/sec)	Estimated forward pumping Capacity (cubic feet/sec)
S-27	2,800	1,600
S-28	3,220	1,800
S-29	4,780	2000

Data and Modeling Needs

(To be jointly developed by Federal/State/Local Agencies)

Climate Change Vulnerability	Task
Flood Control	Datum conversion/operating Rules
	Coastal Digital Elevation Models (DEMs)
	Linking canal routing to groundwater models
	Integrated Groundwater/surface water rainfall/runoff module
	Model certification/Peer review
Saltwater Intrusion	Development of density dependent flow model codes
	Model certification/Peer review
	Acquire storm surge results
	Convert county groundwater models
	Apply Sea Level Rise scenarios
Everglades Restoration	Updating 2x2/RSM for NAVD88
	Climate scenario development
	Evaluation of system-wide performance of CERP

Rising Seas - Water Supply Saltwater Intrusion



Water Supply

- Review groundwater monitoring network used to develop the map of the saltwater-groundwater interface
 - Identify gaps
 - Identify need for new groundwater monitoring wells
 - Identify utilities at risk



Water Supply

- Evaluate opportunities and technologies to reduce additional saltwater intrusion (eg. using reuse as a hydraulic barrier)
- Implement water conservation measures
- Develop alternative water supplies



Current
Restrictions ►



Florida-Friendly
Landscaping ►



More Water-Saving
Tips ►

USEPA – Southeast Climate Change Adaptation Workshop

- Updates from other states with Climate Adaptation plans
 - Utilize existing programs, such as water conservation and regular operation and maintenance of stormwater systems
- Emphasis on regional coordination
- Emphasis on consistent federal guidance

Regional Climate Change Initiatives

- Climate Ready Estuaries
- Southwest Florida Regional Planning Council
– Climate Prosperity Project
- Southeast Florida Regional Climate Change Compact (Palm Beach, Broward, Miami-Dade, and Monroe)

Regional Climate Change Initiatives

- USEPA - Southeast
- Climate Ready Estuaries:
- Southwest Florida Regional Planning Council
– Climate Prosperity Project
- Southeast Florida Regional Climate Change Compact (Palm Beach, Broward, Miami-Dade, and Monroe)